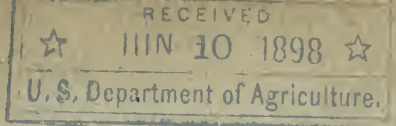


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Bulletin No. 22.—W. B. No. 163.

U. S. DEPARTMENT OF AGRICULTURE,  
WEATHER BUREAU.

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# CLIMATE OF CUBA.

ALSO

A NOTE ON THE WEATHER OF MANILA.

BY

W. F. R. PHILLIPS,  
IN CHARGE OF SECTION OF CLIMATOLOGY.

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Prepared under the direction of the Chief of Weather Bureau.

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WASHINGTON:  
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## LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,  
WEATHER BUREAU,

*Washington, D. C., May 25, 1898.*

HON. JAMES WILSON,

*Secretary of Agriculture, Washington, D. C.*

DEAR SIR: I have the honor to transmit herewith a brief report on the temperature and rainfall, and some other climatic features of the Island of Cuba, which has been somewhat hastily compiled by Dr. W. F. R. Phillips of this office and, also, a note on the weather of Manila.

Meteorological information regarding the Island of Cuba is very scant, and the data compiled in the various tables of the accompanying report represent about all the precise meteorological information to be had for the Island. For the purpose of comparison, the temperature, rainfall, and number of rainy days at Washington, D. C., and New Orleans, La., have been introduced in several of the tables (Nos. 1, 2, and 3), the data being printed in bold-faced type to attract special attention. It will perhaps not be inappropriate to emphasize several points upon which there may be misapprehension. The average summer temperature (June, July, and August) of Habana is 82.0° F., that of New Orleans, 81.6° F., and that of Washington, 75.0° F. The highest temperature recorded in ten years at Habana was 100.6° F., while at Washington the highest temperature has been 104° F. The average annual rainfall at Habana is 51.73 inches, and is less than that at New Orleans, which is 60.52 inches; the rainfall at Washington is 44.70 inches. On page 11 will be found an interesting analysis of the rainfall for thirty years at Habana. During this period five occasions have happened when as much, or more, rain fell in the usual "dry season" as in the "rainy season." The average amount of rain falling in the "rainy season," which extends from May to October, is 32.37 inches. In the same months, the average rainfall for New Orleans is 27.00 inches, and for Washington, 24.10 inches.

I recommend that the report be printed as a bulletin of the Weather Bureau.

Very respectfully,

WILLIS L. MOORE,  
*Chief of Bureau.*

Approved:

JAMES WILSON,  
*Secretary.*





## CLIMATE OF CUBA.

### INTRODUCTION.

There appears to be very little precise and accurate information obtainable regarding the climate of Cuba. Ramon de la Sagra, in his *Historie Physique de Cuba*, quotes, as the earliest record he had consulted, a year's observations of the barometer and thermometer made in Habana in 1794. The thermometer readings, however, appeared to be in error from some cause or other not known and were considered too inaccurate to use. Trustworthy observations of temperature were made in Habana by D. Antonio Robledo, in 1800, 1801, 1806, and 1807, and by D. Joseph Ferrer, in 1810, 1811, and 1812.

Systematic meteorological observations were begun in Habana about 1850 and kept up for some years by Andre Poey, but the data were probably not published, at least no reference to them can be found in the very complete index of meteorological data of the Weather Bureau.

At only one station have systematic meteorological observations been made and published for any considerable time, and that is the observatory of Belen College, Habana. Observations were begun at Belen College in 1859 and have been continued to the present. The daily meteorological observations made at Belen College have been published with more or less regularity in annual volumes. With one or two exceptions, and then only for relatively short periods, no compilation of the monthly averages has been published.

Apart from the observations of Belen College and the brief records already named, only fragmentary meteorological data for other parts of the island have been found. Temperature observations made in 1796-99 at Ubajay, a village about 15 miles southwest of Habana; two years' observations between 1832 and 1835 at Matanzas; eighteen months' observations in 1839 and 1840 at a place in the interior about 150 miles eastward of Habana, the San Fernando mines; and fragmentary observations at Santiago de Cuba and Trinidad de Cuba comprise all the data to be found.

A good deal of meteorological data, especially of rainfall, is, however, to be had for adjacent and neighboring islands, and which by judicious use may be made to be of considerable service in forming an intelligent idea of the climate, or climates, of Cuba. With this purpose in view, temperature and rainfall data have been compiled from the following places, viz: To the north, Key West, Fla., and Nassau, Bahamas; to the east, Port au Prince, Haiti, San Juan,

Puerto Rico, and St. Thomas; and to the south, Kingston and other stations in Jamaica. To the west there are no islands, and the nearest meteorological station is at Merida, Yucatan. Also for general information and because of some climatic relevancy that may exist, meteorological statistics from the islands of Martinique, St. Vincent, Barbados, and Trinidad have been compiled and introduced. The different statistics are shown more or less in detail in the tables to be found in the text, or appended thereto.

#### GEOGRAPHICAL POSITION.

With the exception of the northern part of the Bahamas, the large group of islands collectively known as the West Indies lies within the north tropical zone, being situated in the greater part between the Tropic of Cancer and the tenth parallel of north latitude, and between the sixtieth and eighty-fifth meridians of west longitude. The total number of islands comprising the West Indies is somewhat more than 1,000, and the total land area is, in round numbers, about 95,000 square miles. Cuba, Haiti, Jamaica, and Puerto Rico, which comprise little more than three-fourths of the total area of the West Indies, are virtually included between the parallels of  $17^{\circ}$  and  $23^{\circ}$  north latitude. The greater part of the land area lies at a considerable elevation above sea level; more than 15,500 square miles lie at an altitude of 1,500, or more, feet above the sea. The Bahamas are the lowest and rise but little above the sea, the highest hill being only 230 feet.

The area of Cuba and its dependent islands is about 43,000 square miles. Its extreme length, measured along a curved line following its center, is 730 miles, and its average breadth about 80 miles. The physical aspect of the interior of Cuba, according to Humboldt, "is gently undulating and like that of England, not more than 280 to 380 feet above the level of the sea. The village of Ubajay, about 15 miles distant from Habana, in a southwesterly direction, is 242 feet above the sea."

The highest part of the island is the range of mountains known as the Sierra Maestra, bordering the southeast coast from Cape Cruz to Cape Maysi. The highest mountain peaks are the Pico de Targuino, 7,670 feet, the highest point in the island; Gran Pedra, 5,200 feet; Junque and Ojo del Toro, 3,000 feet. From this range there extends very nearly through the center of the island a general ridge of very much less elevation, though in the extreme western part it rises, in the Pan de Guajaibon, to an elevation of 2,530 feet. This ridge divides the island into two general watersheds, from which its rivers flow in northerly and southerly directions, respectively.

#### CLIMATE.

The climate of the West Indies presents, with respect to both

temperature and rainfall, considerable variations from the generally conceived idea of tropical uniformity. These variations are largely, if not entirely, caused by differences in altitude and position with respect to the prevailing winds of the zone.

Meteorologically considered the West Indies lie between the sea-level isotherms of about  $77^{\circ}$  and  $80^{\circ}$ , and have an average annual rainfall of about 60 inches, the greater part of which falls from May to October. The average humidity of the atmosphere is approximately about 75 per cent of the amount required for saturation at the average annual temperature. The prevailing winds are from the east and north of east, the "northeast trades," and blow with great regularity and uniformity.

#### TEMPERATURE.

The average annual temperature of Habana, as determined from the observations at Belen College, made during the decennium 1888-1897, may be stated in round numbers as  $77^{\circ}$  F. In this decennium the highest annual temperature was  $77.2^{\circ}$ , and this occurred upon three occasions; and the lowest annual temperature was  $76.1^{\circ}$ , and happened upon only one occasion, showing in the ten years an extreme range in annual averages of but  $1.1^{\circ}$  F. It would, therefore, seem probable that the mean temperature for the decennial period 1888-1897 is about a true average for Habana for any long period. The warmest month at Habana is July, with an average temperature of  $82.4^{\circ}$  F. The warmest July in this decennium had an average temperature of  $83.5^{\circ}$  F., and the coolest July a temperature of  $81.7^{\circ}$  F. The warmest single month in the decennial period was August, 1888, when the average temperature was  $84.2^{\circ}$  F. The coldest month is January with an average temperature of  $70.3^{\circ}$  F., and the warmest and coldest Januaries in this decennium were, respectively,  $73.4^{\circ}$  F. and  $67.5^{\circ}$  F. The highest temperature recorded was  $100.6^{\circ}$  F. in July, 1891, and the lowest,  $49.6^{\circ}$  F. in February, 1896.

For Matanzas, on the coast about 50 miles east of Habana, there is a record for two years, beginning in August, 1832, and ending in July, 1833, and again beginning in January, 1835, and ending with December of the same year. From this record the mean annual temperature at Matanzas appears to be about  $78^{\circ}$ . The highest temperature is recorded as  $93^{\circ}$ , and the lowest as  $51^{\circ}$ .

At Santiago, on the extreme southeast coast, the temperature is apparently higher than on the northern and western coasts, and from the meager data available appears to be about  $80^{\circ}$ , with an average difference between the warmest and coldest months of about  $6^{\circ}$  F. A very short fragment of a record of temperature has been found for Trinidad de Cuba, about midway on the southern coast, giving the average temperature from December, 1851, to March,

1852, for the hours of 7 a. m., 2 p. m., and 7 p. m., as  $72.8^{\circ}$ ,  $78.7^{\circ}$ , and  $75.3^{\circ}$  F., respectively, and the observer remarks that during that period the highest temperature recorded was  $84^{\circ}$ , and the lowest  $64.5^{\circ}$  F., and the greatest range in any twenty-four hours was  $9.5^{\circ}$ , which occurred upon the day having the highest temperature.

For the interior of the island only two temperature records have been found, namely, for Ubajay, and the mines of San Fernando. Ubajay is, or was at the time, a village about 15 miles southwest of Habana, and about 242 feet above sea level. Its average temperature from four years' observations was  $73.6^{\circ}$  F. The record is quoted by Baron Humboldt and was made during 1796-1799. The place given as San Fernando mines is about 150 miles eastward of Habana, and is 554 feet above sea level. The temperature record is for the year 1839, and shows an average of  $75^{\circ}$ . From these records the average annual temperature of the interior of the island would appear to be considerably lower than on the coast.

The shortness of the records at Ubajay, Matanzas, and San Fernando mines, and the additional fact of the chronological differences in the several series of observations above quoted preclude any direct comparison between the temperatures at the different places. However, the following table is interesting enough for insertion:

Months.	Ubajay, 1796-99.	Habana.				New Orleans, 1872-91.
		1794.	1800-1, 1806-7.	1810-12.	1888-97.	
January.....	65.3	74.1	65.3	70.0	70.3	54.4
February.....	67.5	75.6	70.0	72.0	72.0	58.5
March.....	66.9	78.8	72.0	75.7	73.2	62.6
April.....	70.0	80.6	75.4	79.0	76.1	69.0
May.....	76.1	82.6	79.7	82.6	78.8	74.9
June.....	82.2	84.9	83.7	83.1	81.5	80.6
July.....	83.7	87.6	85.3	83.3	82.4	82.4
August.....	83.3	86.9	83.6	83.8	82.2	81.8
September.....	79.5	86.7	80.6	82.0	80.7	78.4
October.....	76.5	83.1	78.4	79.5	78.1	70.4
November.....	69.3	81.0	73.6	75.6	75.3	61.2
December.....	62.2	75.0	70.0	72.0	71.4	56.0
Year.....	73.6	81.5	77.0	78.3	76.8	69.2

The temperatures given above for Habana for the years 1800, 1801, 1806, 1807, and 1810-12 are upon the authority of Humboldt and Ramon de la Sagra. Those for Habana for 1888-97 are from the records of Belen College. The data given for Habana for 1794 are the observations already referred to as rejected by Ramon de la Sagra. The New Orleans data are from the Weather Bureau records, and are introduced for the purpose of comparison.

From observations made in Jamaica, at different altitudes, it appears, according to Maxwell Hall, that near the sea level the mean temperature decreases about  $1^{\circ}$  F. for every 315 feet. The following



table showing the decrease of temperature as affected by elevation in Jamaica is given by Maxwell Hall:

Station.	Elevation.	Barometric pressure.	Temperature.			
			Mean.	Maximum.	Minimum.	Range.
	<i>Feet.</i>	<i>Inches.</i>	°	°	°	°
Kingston.....	50	29.95	78.1	87.8	70.7	17.1
Kempshot. ....	1,773	28.20	72.7	80.5	68.0	12.5
Chinchona Plantation....	4,907	25.27	62.6	68.5	57.5	11.0
Portland Gap.....	5,477	24.71	59.7	69.0	54.6	14.4
Blue Mountain Peak .....	7,423	23.14	55.7	71.1	46.3	24.8

This table presents some interesting features. It will be noticed that the mean and minimum temperatures fall progressively as the altitude increases, and likewise the maximum temperature till an elevation of about 5,000 feet is reached, after which it begins to rise. The diurnal range of temperature is, also, shown to undergo first a decrease and subsequently an increase.

It may be stated, generally, that the individual monthly temperatures depart but little from their normals. On the other hand, although the information is not in form for statistical treatment, there is testimony to show that sudden variations in the temperature of the day are not unusual or unknown. Humboldt states that changes in temperature occur very suddenly in Habana, and gives an instance of the fall of the thermometer in the shade in the space of three hours from 89° to 74°, a very considerable fall for the tropics certainly, and one that occurring on a summer's day even in the temperate latitudes would impress itself quite noticeably.

The maximum temperature is reached between noon and 2 o'clock in the afternoon, and the minimum between dawn and sunrise. The average diurnal range of temperature is about 10°. The general course of the temperature from hour to hour is fairly accurately shown in the table following, which has been computed from the reports of Belen College:

Month.	A. M.				Noon.	P. M.				
	4	6	8	10		2	4	6	8	10
January.....	64.6	64.2	65.8	70.9	73.6	74.1	73.2	70.9	69.1	67.6
February.....	66.0	65.7	67.6	72.3	75.6	76.3	75.6	72.9	70.7	69.1
March.....	67.3	66.9	70.3	75.7	78.4	79.2	78.1	75.0	72.7	71.1
April.....	70.0	69.6	78.4	79.5	81.3	81.1	80.8	77.9	75.2	73.8
May.....	72.7	72.9	78.8	82.8	83.1	83.3	82.8	80.4	77.5	76.3
June.....	75.0	75.6	81.5	84.9	85.6	85.5	84.0	82.0	79.2	77.7
July.....	75.7	75.9	81.9	86.2	87.1	87.7	85.6	83.5	80.2	78.8
August.....	76.3	76.3	81.1	85.8	86.9	86.7	85.5	83.3	80.6	79.5
September.....	75.6	75.4	79.3	83.8	85.1	84.6	83.7	81.3	79.3	78.3
October.....	73.9	73.6	76.6	80.6	81.9	82.0	80.4	78.3	77.0	76.1
November.....	71.1	70.7	73.4	77.5	79.2	79.2	77.9	75.7	74.5	73.4
December.....	67.3	66.9	68.7	73.4	75.2	75.7	74.5	72.3	70.9	69.8

## ATMOSPHERIC MOISTURE.

*Relative humidity.*—The relative humidity of the atmosphere appears to be fairly constant, as far as can be determined from the observations available. It averages about 75 per cent of saturation. The mean relative humidity of the different months differs hardly enough to characterize one month as being drier or damper than another.

From observations made at Habana at different hours of the day it appears that the diurnal range of the relative humidity is considerable, varying from a maximum of about 88 per cent in the morning to a minimum of about 64 per cent at noon. The following table shows the average relative humidity at certain hours of the day:

Month.	A. M.				Noon	P. M.				
	4	6	8	10		2	4	6	8	10
January.....	84	85	82	70	63	63	65	93	77	79
February.....	85	85	81	68	62	61	63	70	76	79
March.....	85	85	78	64	58	58	62	70	75	79
April.....	82	84	73	61	68	59	60	67	73	76
May.....	85	85	73	63	62	63	65	69	76	78
June.....	89	89	77	67	67	67	70	74	81	84
July.....	88	88	76	64	63	64	67	70	78	82
August.....	87	88	78	64	62	64	67	72	78	82
September.....	90	90	83	72	70	71	74	78	83	85
October.....	88	89	80	72	69	69	72	78	81	84
November.....	86	87	82	71	68	68	72	77	80	82
December.....	82	82	79	67	64	64	67	72	75	77

*Absolute humidity.*—The absolute humidity is very great. At Habana the average is about 7.5 grains of vapor to the cubic foot of air, and at Kingston, Jamaica, it is about 8.0 grains to the cubic foot. At Habana the absolute humidity varies from 6.2 grains per cubic foot in January to 8.9 grains in September, and at Jamaica from 7.1 grains in January to 8.8 grains in September.

## RAINFALL.

The rainfall shows to a greater degree than the temperature the influence of locality and season of the year. The average rainfall for Habana is about 52 inches for the year, and for Kingston, Jamaica, about 32 inches, while the average for the whole of Jamaica appears to be from about 65 to 67 inches. The greatest rainfall is reported, however, from the island of Martinique, and varies from 133 inches at Fort de France to 93 inches at St. Pierre. The rainfall is, as a rule, greater on north and east coasts than on south and west coasts.

The fall of rain is greatest during the months of May to October. On an average the greatest rainfall occurs in October, and the next greatest in June. During the months of July and August there appears quite a noticeable falling off in the amount of aqueous precipitation in comparison with the months of June and October.

The description of the rainfall of Cuba virtually resolves itself, so far as present information goes, into that of the rainfall at Habana. The short and fragmentary records at Matanzas, Santiago de Cuba, and the San Fernando mines can not be considered as representative of the character and quantity of rainfall in their respective localities.

*Rainfall at Habana.*—Observations have probably been taken continuously at Belen College Observatory since 1859, but the records on file in the Library of the Weather Bureau show a hiatus from 1876 to 1884, inclusive. In the combined periods, 1859-75 and 1885-97, the greatest annual rainfall was 71.40 inches in 1867, and the smallest fall was 40.59 inches in 1861. The average rainfall for the thirty years was 51.73 inches. The monthly rainfall for the thirty years is shown in detail in Table IV.

*Rainy season.*—The season of heavy rainfall for the West Indies in general begins with May and ends with October, as has already been stated.

The rainy season at Habana begins in the latter part of May and the first of June and ends with October. Relatively the greater bulk of the rain falls during the months from June to October. The average rainfall for this period is 32.37 inches, or 63 per cent of the annual fall. The following table shows the amount falling in the rainy and dry seasons of each year of the periods 1859-75 and 1885-97:

*Amount of rainfall at Habana.*

Year.	Rainy season (June to October, inclusive, 5 months).		Dry season (November to May, inclusive, 7 months).	
	Amount.	Per cent of annual.	Amount.	Per cent of annual.
1859.....	28.44	63	16.40	37
1860.....	27.80	63	16.65	37
1861.....	28.76	71	11.83	29
1862.....	36.09	70	15.20	30
1863.....	23.07	51	22.03	49
1864.....	28.53	60	19.35	40
1865.....	25.29	54	21.57	46
1866.....	33.29	73	12.56	27
1867.....	45.66	64	25.74	36
1868.....	22.00	44	27.80	56
1869.....	22.64	41	33.15	59
1870.....	32.38	70	13.89	30
1871.....	39.52	73	14.32	27
1872.....	27.56	58	20.32	42
1873.....	24.12	47	27.35	53
1874.....	42.11	79	11.07	21
1875.....	27.63	65	14.68	35
1885.....	26.79	56	21.38	44
1886.....	47.49	74	17.04	26
1887.....	32.38	66	16.95	34
1888.....	23.97	45	29.54	55
1889.....	35.71	60	24.02	40
1890.....	28.15	50	28.41	50
1891.....	38.02	65	20.51	35
1892.....	49.49	85	8.81	15
1893.....	38.95	64	21.64	36
1894.....	38.08	75	12.63	25
1895.....	38.78	69	17.07	31
1896.....	31.09	60	19.97	40
1897.....	27.70	60	18.51	40

In the island of Jamaica the rainy season appears to begin in May and end, as at Habana, in October. At Port au Prince, Haiti, and San Juan, Puerto Rico, it begins in April and ends at the former in October and at the latter in November, while in the island of St. Thomas, to the east of Puerto Rico, the rainy season appears to be embraced in the months of October, November, and December; also in other islands of the Lesser Antilles irregularities are observed.

*Rainy days.*—The number of days on which rain falls is, upon the whole, considerable, about one day out of three at Habana and almost two days out of every three at Fort de France. The general character of the rainfall appears to be heavy downpours of short duration, and this is particularly the case during the summer months, or as the time is more generally known in the West Indies, “the rainy season.” The following table shows the greatest twenty-four hour rainfall for each month, as recorded at Habana, during the decennium 1888–97:

1888-97.	Greatest rainfall in 24 hours.	1888-97.	Greatest rainfall in 24 hours.
	<i>Inches.</i>		<i>Inches.</i>
January .....	3.98	July .....	3.28
February .....	2.79	August .....	2.70
March .....	3.06	September .....	3.76
April .....	2.46	October .....	5.32
May .....	6.27	November .....	3.73
June .....	4.65	December .....	2.23

Notwithstanding the frequency of rain during the summer months they do not present the greatest number of cloudy days. The rains, “although copious, are of short duration, and those days on which showers do fall are, in general, perfectly cloudless. It may almost be said that during these months no clouds are to be seen in the atmosphere, except while the showers are falling, while in other months cloudy days sometimes occur without rain.”

#### WIND.

The prevailing winds of this region are the “northeast trades.” Except when influenced by the passage of cyclonic and anti-cyclonic areas the wind blows steadily from points between east and north. During the passage of storms and areas of high barometric pressure however, the winds may blow from any direction, being governed in this regard by the location of the center of cyclonic or anti-cyclonic activity. In the winter season, cold waves in the United States, when extending far to the southward, cause cold, northerly winds, or “northerers,” along the north Cuban coast.

The average velocity of the wind at Habana is about 7.5 miles an hour. The velocity, however, varies considerably with the season, being highest in winter, when its average velocity is 8.5 miles an hour, and lowest in summer when its velocity is 6.5 miles an hour.



The velocity is also higher on northern coasts than on southern coasts, as is shown by comparison of the anemometer records of Habana and Kingston. The diurnal variation in the velocity of the wind is much more pronounced than the seasonal variation. The following table shows the average velocity of the wind at certain hours of the day at Habana, Cuba, and Kingston, Jamaica:

Hour.	Miles an hour.	
	Habana.	Kingston.
4 a. m.....	4.3	2.0
6 a. m.....	4.5	2.0
8 a. m.....	6.5	2.1
10 a. m.....	9.2	4.3
Noon.....	10.7	6.9
2 p. m.....	11.4	7.6
4 p. m.....	10.7	6.6
6 p. m.....	8.7	4.5
8 p. m.....	6.9	2.7
10 p. m.....	5.6	9.1

In climates having such high temperatures and humidities as shown for the West Indies, the velocity of the wind and its constancy are of the greatest importance to both comfort and health.

#### CLOUDS.

But little can be said of the clouds. Maxwell Hall states that:

During the winter months there is much detached stratus; during the summer months there is much cumulus, which keeps the afternoons cool, especially as the cumuli soon degenerate into strato-cirrus, and then disappear, leaving the nights perfectly clear. When rain begins to fall from a large cumulus a quantity of cloud is poured into the air from the top of the cumulus as smoke from a factory chimney. This takes place in all parts of the world when rain falls from cumulus, but in the temperate zones only a little *false cirrus*, or cirri-form is thrown off. In Jamaica the process is on a gigantic scale, and the cloud is spread out as a sheet, far and wide, so as to shade the land for an hour or two from the direct rays of the afternoon sun. It is, therefore, a common cloud in Jamaica. Its texture at first is thick and woolly, but as it spreads the sheet becomes thinner \* \* \* and it finally disappears a little after sunset, leaving the evening sky perfectly clear.

#### STORMS.

Thunderstorms, with much electrical display, are of frequent or almost daily occurrence, but little damage results from them. The West Indies are more or less subject during each summer to one or more severe tropical storms or hurricanes. These storms are more likely to occur in the months of August, September, and October.

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17. Observatorio Meteorologico del Institutio Literario del Estado. Merida, Yucatan.

TABLE I.—Average monthly and annual temperature, in degrees Fahrenheit.

Place.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.	Series.		Record.		Authority.†
														Begins.	Ends.	Years.	Months.	
Washington, D. C. ....	33.2	35.8	41.3	53.0	65.9	73.2	76.9	74.5	67.8	56.2	44.5	36.2	54.7	1871	1895	25	.....	(3)
New Orleans, La. ....	53.6	59.1	62.0	69.0	74.6	80.3	82.4	81.5	78.3	69.3	60.7	55.5	68.8	1871	1895	25	.....	(3)
Key West, Fla. ....	70.6	72.2	73.0	76.4	79.6	83.0	84.4	84.1	82.8	78.9	74.7	70.5	77.5	1871	1895	21	.....	(8)
Habana, Cuba. ....	70.3	72.0	73.2	76.1	78.8	81.5	82.4	82.2	80.7	78.1	75.3	71.4	76.8	1888	1897	10	.....	(4)
Ubalay, Cuba * .....	64.5	67.5	66.8	70.0	76.0	82.2	83.5	83.2	82.0	76.5	69.2	63.2	73.5	1796	1799	4	.....	(11)
Mines of San Fernando, Cuba..	69.0	71.4	73.2	74.6	77.9	78.9	80.5	79.6	78.6	75.9	72.7	67.9	75.0	1839	1839	1	.....	(1)
Matanzas, Cuba .....	73.6	72.0	73.6	80.1	80.8	82.2	81.5	80.6	82.3	78.8	77.7	74.8	78.4	1832	1835	2	.....	(1)
Santiago, Cuba .....	77.0	77.0	77.6	80.0	81.0	83.0	83.0	83.0	82.0	81.0	79.0	76.0	78.0	1881	1882	1	.....	(8)
San Juan, Puerto Rico .....	76.6	75.7	76.6	77.9	79.3	81.5	81.1	81.3	81.0	80.6	79.2	76.5	78.8	1876	1885	12	.....	(6)
St. Thomas .....	80.2	78.4	78.0	79.5	79.5	80.6	82.9	83.3	83.8	84.0	83.3	81.9	81.0	1860	1863	3	.....	(2)
Kingston, Jamaica .....	74.6	74.7	75.8	77.9	79.4	80.8	81.1	80.4	80.1	78.9	77.8	75.7	78.1	1880	1890	10	.....	(12)
Barbados† .....	73.6	73.4	73.5	76.2	76.2	76.7	76.7	76.7	76.7	76.9	76.1	75.0	75.6	.....	.....	20	.....	(15)

\* About 15 miles southwest of Habana.

† Country district in island.

‡ See page 14.

TABLE II.—Average monthly and annual rainfall, in inches and hundredths.

Place.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.	Series,		Record.		Authority.
														Begins.	Ends.	Years.	Months.	
Washington, D. C. ....	3.50	3.31	4.08	3.16	3.90	4.29	4.84	4.44	3.82	3.27	2.83	3.01	45.61	1871	1871	25	.....	(8)
New Orleans, La. ....	5.17	4.56	5.35	5.28	4.76	6.49	6.50	6.02	4.70	3.25	4.30	4.38	60.32	1871	1871	25	.....	(8)
Key West, Fla. ....	2.10	1.70	1.20	1.30	3.30	4.10	4.20	5.10	7.50	5.30	2.50	1.70	40.10	1871	1871	25	.....	(8)
Nassau, New Providence .....	1.97	2.57	0.54	1.70	7.00	6.83	4.17	6.65	7.74	5.90	1.88	2.10	46.75	1840	1845	3	.....	(16)
Habana, Cuba. ....	2.82	2.52	2.50	1.46	5.15	8.29	5.09	5.43	7.62	8.49	4.24	1.93	55.14	1888	1897	10	.....	(4)
Do. ....	2.71	2.27	1.83	2.83	4.47	7.16	5.05	6.02	6.71	7.42	3.08	2.15	51.73	1859	1897	30	.....	(4)
Matanzas, Cuba. ....	3.18	0.77	0.63	1.92	2.32	5.35	9.57	11.50	7.80	7.47	3.38	1.40	55.29	1835	1895	1	.....	(1)
Mines of San Fernando, Cuba. ....	2.74	0.59	2.49	2.09	20.28	14.56	.....	.....	.....	.....	.....	.....	.....	1840	.....	6	.....	(1)
Santiago, Cuba. ....	0.51	0.76	1.70	2.41	4.53	0.48	1.24	5.20	8.96	3.90	2.86	1.77	33.82	1881	1882	1	.....	(14)
Jamaica† .....	4.46	2.38	3.34	3.25	9.05	4.74	4.31	6.66	6.85	10.07	6.71	5.59	67.41	1870	1879	10	.....	(14)
Do. ....	3.78	2.51	2.49	4.18	9.07	7.77	4.32	6.83	6.87	8.04	5.08	5.00	66.54	1880	1889	10	.....	(12)
Kingston .....	0.96	0.32	1.59	1.02	6.00	5.51	2.15	4.09	3.59	4.69	1.22	1.50	32.64	1880	1890	10	.....	(2)
Ross' View. ....	3.11	5.28	1.50	3.54	1.46	3.15	1.93	2.36	7.87	12.20	8.74	3.11	54.33	1872	1873	2	.....	(16)
Port au Prince, Haiti. ....	1.28	2.35	3.55	9.52	12.42	4.50	4.10	5.51	6.10	6.42	3.93	1.49	61.17	1863	1867	4	5	(6)
San Juan, Puerto Rico .....	2.28	1.80	2.67	5.56	6.38	5.96	5.82	6.21	5.83	5.83	7.02	3.88	61.21	1876	1895	12	.....	(2)
St. Thomas .....	2.87	2.24	0.75	2.56	1.50	2.99	3.35	2.32	2.99	5.83	6.42	4.41	38.23	1863	1872	10	.....	(2)
Fort de France, Martinique. ....	8.03	4.84	4.20	3.96	6.38	14.29	15.59	20.67	14.41	12.48	16.10	12.05	133.11	1857	1879	17	.....	(2)
St. Pierre, Martinique .....	4.80	4.39	4.33	4.86	6.81	9.76	8.39	14.33	11.02	9.48	8.58	7.40	92.66	1850	1874	45	.....	(2)
Kingstown, St. Vincent .....	4.32	2.54	3.11	3.54	6.36	8.89	8.22	8.30	8.90	9.13	8.88	5.49	77.61	1830	1841	12	.....	(3)
Bayabou, St. Vincent .....	3.26	2.00	2.84	1.70	6.36	7.61	7.80	6.75	10.08	9.12	8.89	4.45	69.56	1831	1836	5	.....	(15)
Barbados† .....	3.26	2.58	1.47	1.99	3.54	4.45	5.70	7.24	6.24	8.69	7.08	4.50	57.74	1862	1888	17	.....	(3)
Royal Bot. Gardens, Trinidad. ....	2.83	1.80	1.85	1.88	3.55	7.95	9.13	10.45	7.88	6.57	6.80	4.72	65.45	1862	1888	17	.....	(17)
Merida, Yucatan .....	1.02	0.53	0.70	0.17	0.96	5.88	3.86	7.76	4.50	2.95	4.12	1.24	33.86	1895	1897	3	.....	(17)

† Average for entire island.

TABLE III.—Average number of days on which ruin fell.

Place.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.	Series.		Record.		Authority.
														Begins.	Ends.	Years.	Months.	
Washington, D. C. ....	12.1	10.9	12.2	11.2	12.2	10.5	11.1	11.3	8.6	8.8	10.1	10.4	129.2	1871	1895	25	.....	(3)
New Orleans, La. ....	11.2	9.4	9.8	7.9	9.9	13.6	15.8	14.4	10.8	7.4	9.4	11.9	151.7	1871	1895	25	.....	(3)
Key West, Fla. ....	8.1	6.8	4.9	4.5	8.5	11.8	12.6	14.6	16.4	12.4	8.0	7.2	177.7	1871	1895	25	.....	(3)
Havana, Cuba. ....	7.5	5.7	5.5	4.6	9.3	12.8	12.7	12.6	15.4	13.1	10.2	8.5	119.9	1863	1897	15	.....	(4)
Mines of San Fernando, Cuba.	4.0	6.0	9.0	6.0	24.0	21.0	22.0	20.0	16.0	22.0	2.0	6.0	.....	1839	1839	1	.....	(1)
Santiago, Cuba. ....	2.0	3.0	6.0	9.0	11.0	5.0	5.0	16.0	19.0	11.0	9.0	3.0	.....	1881	1882	1	.....	(8)
Ross' View, Jamaica. ....	12.2	12.0	9.4	12.8	9.4	14.2	8.2	12.6	17.8	17.2	21.6	13.8	.....	1869	1873	5	.....	(2)
Denbigh, Jamaica. ....	4.7	4.4	5.1	5.3	8.5	5.6	5.6	8.2	8.3	11.2	7.6	4.6	.....	.....	.....	.....	.....	(14)
Port au Prince, Haiti. ....	5.0	10.0	10.0	15.0	19.0	14.0	12.0	16.0	15.0	18.0	12.0	5.0	.....	1863	1867	4	.....	(2)
Fort de France, Martinique. ....	20.4	14.5	13.8	10.9	15.1	20.1	21.5	20.1	18.5	19.9	17.2	19.2	211.2	1857	1879	17	.....	(2)
Barbados†. ....	17.0	14.7	10.3	11.0	13.0	18.0	19.7	20.7	18.0	19.7	18.0	17.3	.....	.....	.....	.....	.....	(15)
Merida, Yucatan. ....	5.0	4.7	3.0	1.0	3.7	15.0	16.7	17.3	16.7	10.0	10.0	8.5	.....	1895	1897	3	.....	(17)

† Average for entire island.



TABLE IV.—*Temperature and rainfall at Habana, Cuba.*

## MEAN MONTHLY TEMPERATURE.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1888 ..	72.0	72.9	73.6	75.7	78.4	81.1	82.6	84.2	80.8	79.2	75.0	70.5	77.2
1889 ..	72.0	72.3	71.8	76.1	79.0	82.2	83.1	81.9	82.2	77.2	76.6	70.5	77.2
1890 ..	73.4	73.8	72.5	76.2	79.3	82.2	82.6	81.0	79.5	79.0	75.2	70.2	77.0
1891 ..	69.3	73.6	74.1	74.8	77.7	82.8	83.5	82.2	80.8	76.3	74.1	73.0	76.8
1892 ..	69.6	70.7	71.1	77.0	79.3	80.2	81.9	81.5	80.6	77.0	73.2	71.4	76.1
1893 ..	67.5	73.6	74.3	77.9	80.1	81.1	82.6	80.1	79.9	79.2	74.8	71.6	77.1
1894 ..	71.2	72.5	73.3	76.3	77.9	79.8	81.7	82.6	80.4	76.6	74.8	70.7	76.5
1895 ..	70.3	66.9	74.1	75.9	79.9	81.9	83.5	82.2	81.1	78.4	75.4	69.6	76.6
1896 ..	68.7	69.8	72.1	75.4	79.2	82.2	81.9	82.8	81.0	79.3	77.4	71.6	76.8
1897 ..	69.1	73.9	76.1	76.1	77.9	81.3	81.7	82.2	79.0	77.9	76.1	73.8	77.2
Mean	70.3	72.0	73.2	76.1	78.8	81.5	82.4	82.2	80.7	78.1	75.3	71.4	76.8

## ABSOLUTE MAXIMUM TEMPERATURE.

1888 ..	82.4	86.4	91.4	87.3	96.3	95.7	95.5	98.6	94.1	91.8	86.0	80.6	98.6
1889 ..	83.1	87.4	84.7	88.5	93.6	96.8	97.7	96.2	93.9	86.4	86.9	80.6	97.7
1890 ..	82.0	87.1	91.4	92.8	97.9	96.4	99.7	92.1	92.5	89.1	84.4	82.8	99.7
1891 ..	80.8	85.8	89.1	90.5	93.7	97.7	100.6	91.8	92.3	87.1	85.1	82.0	100.6
1892 ..	82.0	84.4	89.4	90.1	91.6	94.6	92.8	91.8	93.4	88.3	83.8	83.7	94.6
1893 ..	80.2	87.3	90.1	91.6	95.4	95.7	92.1	93.9	96.6	91.9	84.0	81.7	95.7
1894 ..	83.1	84.9	88.7	86.5	93.2	92.3	95.2	93.9	89.1	86.9	86.7	82.6	95.2
1895 ..	84.4	84.2	87.4	93.6	99.0	95.4	95.2	96.3	89.6	89.4	83.3	82.2	99.0
1896 ..	80.9	83.5	88.2	85.6	93.6	97.3	92.3	90.7	90.1	89.8	88.7	81.5	97.3
1897 ..	79.9	87.6	89.0	87.4	86.4	91.6	91.2	93.2	90.3	89.8	88.2	86.0	93.2

## ABSOLUTE MINIMUM TEMPERATURE.

1888 ..	59.4	59.4	62.4	62.8	66.6	69.1	73.2	73.0	72.7	69.1	56.5	55.4	55.4
1889 ..	57.2	60.4	59.4	62.0	64.4	71.4	73.0	72.5	74.1	65.1	61.0	60.6	57.2
1890 ..	63.7	61.9	55.0	65.5	69.8	73.0	72.0	71.2	70.9	61.9	64.8	56.7	55.0
1891 ..	52.3	58.3	60.8	52.9	64.9	72.1	72.3	72.7	71.6	63.3	61.3	62.2	52.3
1892 ..	54.0	59.0	55.0	64.8	68.2	72.1	71.2	72.1	72.5	61.7	61.2	57.7	54.0
1893 ..	53.8	57.9	60.6	60.4	66.7	70.7	72.9	73.4	72.5	71.6	63.1	60.8	53.8
1894 ..	59.0	60.1	60.3	61.5	64.8	70.7	72.1	71.6	72.1	64.8	64.2	51.8	51.8
1895 ..	55.6	51.4	56.8	61.3	70.9	72.7	73.4	72.7	72.7	66.9	62.8	54.9	51.4
1896 ..	54.5	49.6	58.3	64.4	66.2	73.0	73.4	72.7	73.6	69.8	67.1	59.0	49.6
1897 ..	57.2	57.2	59.0	65.5	65.8	71.6	71.6	69.8	72.0	63.7	65.1	60.4	52.2

## PRECIPITATION (in inches),

1859 ..	5.81	0.19	0.78	0.40	2.00	2.95	3.70	7.93	3.94	9.92	5.93	1.29	44.84
1860 ..	2.02	3.42	0.55	6.02	1.07	7.88	2.78	6.08	6.47	4.59	0.59	2.98	44.45
1861 ..	0.61	0.59	2.39	2.05	4.43	3.19	4.88	8.39	5.01	7.29	0.63	1.13	40.59
1862 ..	2.00	1.09	2.22	1.17	3.26	9.20	8.42	5.70	4.90	7.87	2.28	3.18	51.29
1863 ..	1.48	0.28	2.70	0.38	10.22	3.20	2.14	7.89	4.61	5.23	2.49	4.48	45.10
1864 ..	4.50	1.43	3.73	2.05	2.59	7.32	5.13	7.09	3.63	5.36	2.33	2.72	47.88
1865 ..	4.88	2.92	2.70	0.07	4.98	1.17	2.55	5.41	7.36	8.80	5.85	0.17	46.86
1866 ..	2.01	2.72	0.57	1.93	1.75	3.72	12.33	4.42	6.81	6.11	2.52	1.06	45.95
1867 ..	2.89	1.16	0.52	1.20	13.95	14.44	6.71	7.19	6.43	10.89	1.47	4.55	71.40
1868 ..	3.22	2.36	1.31	6.60	3.85	2.99	1.95	2.96	5.39	8.71	8.65	1.81	49.80
1869 ..	2.02	2.02	2.10	22.57	2.48	4.83	4.13	4.08	7.04	2.56	0.87	1.09	55.79
1870 ..	1.50	1.62	1.04	2.44	4.70	8.65	8.20	3.15	2.42	9.96	1.88	0.71	46.27
1871 ..	2.09	0.00	0.35	0.06	6.67	3.92	6.65	8.32	15.98	4.65	0.90	4.25	53.84
1872 ..	6.29	1.86	1.06	0.19	2.94	1.46	6.38	8.50	7.14	4.01	3.97	47.88	
1873 ..	5.32	9.41	1.02	4.92	2.38	4.76	1.15	4.52	6.88	6.81	1.62	2.68	51.47
1874 ..	1.64	1.30	0.11	1.72	2.31	15.25	4.96	6.64	5.92	9.34	1.34	2.65	53.18
1875 ..	1.72	4.09	1.07	4.18	2.89	1.24	2.36	10.60	10.02	3.41	0.47	0.26	42.31
1885 ..	2.16	5.54	1.42	1.55	6.35	8.03	0.64	4.52	6.00	7.60	1.92	2.44	48.17
1886 ..	2.69	1.09	0.73	8.07	3.06	12.62	15.06	10.03	4.52	5.26	0.73	0.67	64.53
1887 ..	3.33	0.01	3.52	2.69	0.68	15.19	3.21	5.12	2.44	6.42	3.50	3.22	49.33
1888 ..	0.02	3.07	1.56	0.82	13.58	7.92	4.17	1.45	6.47	3.96	7.47	3.02	53.51
1889 ..	5.77	4.37	5.05	2.28	1.16	9.30	5.24	9.36	3.31	8.50	3.91	1.48	59.73
1890 ..	0.52	0.66	0.54	0.06	17.51	1.50	7.13	5.25	12.27	2.00	7.94	1.18	56.56
1891 ..	3.45	1.80	5.05	1.98	1.58	3.14	6.16	8.72	5.50	14.50	5.19	1.46	58.53
1892 ..	0.90	1.24	1.70	0.02	1.27	17.56	5.03	5.75	9.24	11.91	2.35	1.33	58.30
1893 ..	4.21	0.26	0.56	1.12	5.79	10.67	4.64	7.18	3.15	13.31	4.14	5.56	60.59
1894 ..	0.46	1.26	2.42	0.78	2.60	6.78	5.11	2.40	10.26	13.53	4.17	0.94	50.71
1895 ..	0.45	5.05	1.31	1.85	4.92	3.76	4.33	4.65	13.57	12.47	2.16	1.33	55.85
1896 ..	1.11	6.22	3.69	0.00	2.70	16.91	3.10	3.88	5.73	1.47	3.53	2.72	51.06
1897 ..	6.31	1.23	3.22	5.67	0.33	5.26	5.98	5.72	7.61	3.13	1.45	0.30	46.21
Mean.	2.71	2.27	1.83	2.83	4.47	7.16	5.06	6.02	6.71	7.42	3.08	2.15	51.73

TABLE IV.—*Temperature and rainfall at Habana, Cuba—Continued.*

## NUMBER OF DAYS ON WHICH RAIN FELL.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1863..	11	7	8	2	16	5	10	10	17	15	13	9	123
1864..	12	6	7	4	6	11	14	12	7	10	8	7	104
1865..	7	6	6	2	11	7	9	10	20	17	11	3	109
1866..	8	6	5	3	4	15	20	11	16	9	7	4	108
1867..	6	3	5	5	10	20	15	19	16	17	4	4	124
1868..	5	5	4	7	6	13	9	9	10	19	13	14	114
1869..	6	5	4	6	6	9	16	14	14	7	6	11	104
1870..	4	8	3	6	7	11	9	9	11	20	5	9	102
1871..	4	0	1	2	12	9	9	15	17	16	6	8	99
1872..	9	7	6	3	6	4	7	12	14	12	16	10	106
1873..	12	2	7	4	8	11	11	11	12	14	8	9	109
1874..	6	5	2	7	8	18	15	12	15	15	12	7	102
1875..	4	5	2	9	12	9	13	12	16	12	5	2	101
1885..	10	13	8	6	19	14	10	11	18	19	8	12	148
1886..	11	8	7	9	4	13	19	13	12	18	9	8	131
1887..	6	1	9	6	7	21	13	15	18	16	10	13	135
1888..	1	9	6	4	14	18	12	13	17	11	14	7	126
1889..	12	9	10	4	3	13	14	21	11	12	9	11	129
1890..	9	3	3	3	16	7	14	16	18	13	18	6	126
1891..	7	2	6	5	8	11	13	13	19	21	13	9	127
1892..	9	6	7	1	6	20	12	13	16	21	9	4	124
1893..	14	5	3	5	11	19	12	16	18	22	8	16	149
1894..	6	5	9	1	10	16	14	9	15	19	14	11	129
1895..	4	9	3	6	14	12	11	11	13	14	15	8	120
1896..	6	11	8	0	8	16	12	11	15	13	11	12	124
1897..	7	3	4	9	9	11	16	10	25	10	12	6	121
Mean	7.5	5.7	5.5	4.6	9.3	12.8	12.7	12.6	15.4	15.1	10.2	8.5	119.9

TABLE V.—*Temperature and rainfall at San Juan, Puerto Rico.*

## MEAN MONTHLY TEMPERATURE.

1876..	.....	.....	.....	.....	.....	.....	.....	83.8	83.1	82.9	81.1	80.4	.....
1877..	79.0	78.1	79.5	81.7	84.6	84.0	84.4	85.5	84.7	84.7	82.2	80.2	82.4
1878..	79.3	81.0	81.0	82.0	84.6	86.0	85.6	85.6	84.6	84.0	81.9	79.9	82.9
1879..	78.6	78.2	78.8	80.8	81.7	83.7	84.9	83.8	81.0	79.3	77.4	73.8	80.2
1880..	73.4	72.3	74.8	73.4	79.2	81.1	81.7	82.4	82.0	81.3	80.2	77.7	78.2
1881..	77.4	75.9	77.7	79.5	80.6	81.7	81.8	82.0	82.2	.....	.....	.....	.....
1884..	.....	.....	.....	.....	.....	82.4	81.7	.....	.....	.....	.....	.....	.....
1888..	.....	.....	.....	.....	77.4	79.2	80.8	80.6	80.6	80.8	79.9	78.8	78.1
1889..	76.8	77.2	77.7	.....	.....	.....	.....	80.6	79.7	80.6	.....	75.6	79.2
1890..	74.5	.....	74.5	.....	77.0	.....	.....	.....	.....	.....	.....	.....	76.8
1891..	82.4	.....	74.7	.....	77.4	78.8	79.5	79.2	80.1	80.1	77.9	74.8	78.4
1892..	73.8	72.7	74.3	74.1	76.1	77.2	78.4	78.4	.....	76.3	72.7	72.3	.....
1893..	.....	.....	.....	.....	.....	.....	79.0	.....	.....	.....	.....	.....	.....
1894..	.....	.....	.....	.....	.....	.....	.....	7.8	76.6	76.6	.....	71.6	73.6
1895..	70.0	71.0	72.9	74.1	74.5	.....	76.1	76.8	76.8	.....	.....	.....	.....
Mean	76.6	75.7	76.6	77.9	79.3	81.5	81.1	81.3	81.0	80.6	79.2	76.5	78.9

## ABSOLUTE MAXIMUM TEMPERATURE.

1876..	.....	.....	.....	.....	.....	.....	.....	93.6	92.5	92.5	92.5	91.4	.....
1877..	89.0	88.5	93.2	95.0	98.1	95.4	95.0	95.4	94.8	97.9	99.1	92.5	.....
1878..	90.3	92.5	95.4	95.0	100.8	99.3	96.4	99.0	96.8	96.1	93.9	89.6	.....
1879..	87.1	90.3	90.0	93.2	93.9	97.2	96.8	97.2	92.1	90.0	87.1	82.8	.....
1880..	82.4	81.0	89.6	90.3	93.2	90.0	92.1	92.1	91.4	93.2	92.8	94.6	.....
1881..	90.0	88.2	91.0	93.2	96.1	92.5	93.9	94.3	95.4	.....	.....	.....	.....
1884..	.....	.....	.....	.....	.....	97.2	94.3	.....	.....	.....	.....	.....	.....
1888..	.....	.....	.....	.....	87.1	88.2	88.5	89.2	89.6	89.6	90.3	90.3	90.3
1889..	88.5	87.8	90.0	.....	.....	92.1	.....	89.6	90.3	90.3	.....	84.2	92.1
1890..	.....	.....	.....	.....	.....	89.6	.....	.....	.....	.....	.....	.....	89.6
1891..	90.7	.....	88.9	.....	89.6	91.0	87.4	88.2	89.2	90.3	90.3	89.6	91.0
1892..	93.2	91.4	87.1	83.1	86.0	86.0	87.1	90.0	.....	90.0	87.4	86.0	.....
1893..	.....	.....	.....	.....	.....	.....	87.1	.....	.....	.....	.....	.....	.....
1894..	.....	.....	.....	.....	.....	.....	.....	87.8	88.2	91.8	.....	87.1	91.8
1895..	83.5	.....	84.7	90.7	92.1	.....	86.0	86.4	88.7	.....	.....	.....	.....

TABLE V.—*Temperature and rainfall at San Juan, Puerto Rico—Continued.*

## ABSOLUTE MINIMUM TEMPERATURE.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1876 ..	69.1	68.7	68.0	72.0	72.7	72.7	74.1	74.5	73.4	73.0	72.3	70.5	.....
1877 ..	69.4	70.2	70.9	71.6	73.8	75.2	71.6	76.3	74.8	75.2	71.2	65.8	.....
1878 ..	65.5	64.8	69.1	70.9	70.9	72.7	72.3	72.3	69.1	69.8	68.0	64.8	.....
1879 ..	64.8	63.0	66.2	67.3	69.4	66.2	69.1	71.6	70.5	70.9	70.2	66.6	.....
1880 ..	65.1	64.4	64.8	66.2	69.1	72.0	66.9	67.3	67.3	.....	.....	.....	.....
1881 ..	.....	.....	.....	.....	70.9	70.5	.....	.....	.....	.....	.....	.....	.....
1882 ..	.....	.....	62.6	.....	66.6	71.2	73.0	69.8	72.3	71.6	69.8	68.7	62.6
1883 ..	65.5	65.8	65.3	.....	.....	.....	.....	71.6	70.5	71.6	.....	66.6	65.3
1884 ..	65.5	.....	63.3	.....	69.1	.....	.....	.....	.....	.....	.....	63.3	63.3
1885 ..	65.1	.....	63.7	.....	67.6	64.8	70.9	70.2	69.8	69.8	67.3	62.2	63.7
1886 ..	63.3	61.2	64.4	64.8	64.4	65.1	68.0	64.8	.....	61.2	59.4	56.1	.....
1887 ..	.....	.....	.....	.....	.....	.....	64.0	.....	.....	.....	.....	.....	.....
1888 ..	57.2	.....	.....	.....	.....	.....	.....	64.0	64.9	62.2	.....	57.9	57.2
1889 ..	57.6	58.3	60.1	60.8	62.6	.....	65.3	65.5	65.1	.....	.....	.....	.....

## PRECIPITATION (in inches).

1876 ..	.....	.....	.....	.....	.....	.....	.....	4.29	10.00	3.11	7.50	3.20	.....
1877 ..	3.21	5.26	2.60	7.60	1.05	7.32	8.88	3.25	4.68	9.63	6.53	6.34	66.35
1878 ..	2.78	1.59	12.40	4.10	10.26	8.17	11.58	5.25	5.39	11.98	6.84	2.02	82.64
1879 ..	3.50	1.45	4.31	11.78	12.25	8.91	5.76	8.39	3.77	4.46	11.73	3.51	79.82
1880 ..	2.59	1.98	0.51	1.61	8.23	5.45	5.25	5.59	3.52	1.97	6.84	2.25	45.79
1881 ..	1.07	2.16	0.41	3.72	5.74	7.00	6.20	5.82	9.54	.....	.....	.....	.....
1882 ..	.....	.....	.....	.....	.....	4.43	4.35	.....	.....	.....	.....	.....	.....
1883 ..	.....	.....	.....	.....	3.88	5.32	2.48	6.53	7.73	4.64	3.40	5.51	48.81
1884 ..	2.35	1.30	1.10	.....	.....	.....	.....	6.22	7.41	4.68	.....	4.50	63.18
1885 ..	8.60	.....	2.68	.....	1.90	.....	.....	.....	.....	.....	.....	.....	50.90
1886 ..	1.38	.....	0.29	.....	4.91	4.62	4.81	17.07	4.00	8.81	10.90	4.28	64.63
1887 ..	1.89	0.35	1.00	2.10	9.10	2.34	5.56	4.28	.....	2.96	7.24	1.90	.....
1888 ..	.....	.....	.....	.....	.....	.....	.....	4.50	5.20	3.29	.....	5.28	48.31
1889 ..	2.92	0.70	1.39	7.37	6.43	.....	3.30	3.04	2.91	.....	.....	.....	.....
Mean	2.28	1.80	2.67	5.35	6.38	5.96	5.82	6.21	5.83	5.63	7.62	3.88	59.45

TABLE VI.—*Climatological data for several stations.*

## WASHINGTON, D. C. (25 years):

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Temperature:													
Mean.....	33.2	35.8	41.3	53.0	63.9	73.2	76.8	74.6	67.8	56.2	44.5	36.2	54.7
Highest.....	76	78	83	93	96	102	103	101	104	92	80	73	104
Lowest.....	-14	-2	4	22	34	46	53	49	38	26	12	-13	-14
Rainfall:													
Mean.....	3.50	3.31	4.08	3.16	3.90	4.29	4.84	4.44	3.82	3.27	2.88	3.01	43.61
Greatest.....	7.09	6.84	8.84	9.13	10.69	8.55	10.63	12.93	10.81	8.69	7.18	4.94	61.33
Least.....	0.23	0.93	0.98	1.07	1.01	1.63	0.82	0.85	0.14	0.29	0.79	0.19	30.85
No. days on which rain fell:													
Average.....	12	11	12	11	12	11	11	12	9	9	10	11	129
Greatest.....	20	17	18	17	18	16	17	18	15	16	17	15	153
Least.....	4	4	5	7	5	5	8	5	2	3	5	5	113
Humidity:													
Mean relative, per cent.....	68	71	60	62	65	71	67	72	71	61	67	72	72
Mean absolute, grs. per cu. ft.	1.5	1.7	1.8	2.9	4.4	6.2	6.8	6.6	5.4	3.3	2.3	1.8	.....

## NEW ORLEANS, LA. (25 years).

Temperature:													
Mean.....	53.8	58.1	62.0	69.0	74.6	80.3	82.2	81.5	78.3	69.8	60.7	55.5	68.8
Highest.....	82	82	84	88	92	97	99	96	95	90	85	81	99
Lowest.....	15	25	30	38	53	58	67	63	56	40	30	20	15
Rainfall:													
Mean.....	5.17	4.56	5.35	5.28	4.76	6.49	6.50	6.02	4.70	3.25	4.30	4.38	60.52
Greatest.....	11.15	13.85	11.32	14.20	18.68	12.05	12.93	22.74	13.55	9.15	7.78	9.05	85.73
Least.....	0.66	0.04	0.92	0.26	0.22	2.71	2.02	0.87	0.25	T.	0.42	0.67	38.62



TABLE VI.—*Climatological data for several stations—Continued.*NEW ORLEANS, LA. (25 years)—*Continued.*

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
No. days on which rain fell:													
Average .....	11	10	9	8	9	14	16	14	11	7	9	11	128
Greatest .....	22	18	16	12	16	22	21	25	19	14	22	18	185
Least .....	5	2	5	2	3	5	10	7	2	0	4	2	100
Humidity:													
Mean relative, per cent. ....	79	81	76	76	74	78	78	79	77	74	79	80	78
Mean absolute, grs. per cu. ft.	3.4	4.5	4.1	5.6	6.6	8.2	8.8	8.5	7.5	5.6	4.4	3.8	.....

## HABANA, CUBA (10 years).

Temperature:													
Mean .....	70.3	72.0	73.2	76.1	78.8	81.5	82.4	82.2	80.7	78.1	75.3	71.4	76.8
Highest .....	84.4	87.6	91.4	93.6	99.0	97.7	100.6	98.6	96.6	91.9	88.7	86.0	100.6
Lowest .....	52.2	49.6	55.0	52.9	64.4	69.1	71.2	69.8	70.9	61.7	56.5	51.8	49.6
Rainfall:													
Mean .....	2.32	2.52	2.50	1.46	5.15	8.29	5.09	5.43	7.62	8.49	4.24	1.93	55.14
Greatest .....	6.31	6.18	5.05	5.67	17.51	17.56	7.13	9.36	13.57	13.53	7.94	5.56	60.06
Least .....	0.02	0.20	0.56	0.00	0.33	1.50	3.10	1.45	3.15	1.47	1.45	0.30	46.02
No. days on which rain fell:													
Mean .....	7.5	6.2	5.9	3.8	9.9	14.3	13.0	13.3	16.7	15.6	12.3	9.0	127.5
Greatest .....	14	11	10	9	16	20	16	21	25	22	18	16	149
Least .....	1	2	3	0	3	7	11	9	11	10	8	4	120
Humidity:													
Mean relative per cent. ....	75	73	70	69	71	76	74	75	79	78	77	74	74
Mean absolute grs. per cu. ft.	6.2	6.4	6.3	6.8	7.6	8.7	8.8	8.8	8.9	8.1	7.4	6.3	7.5
Wind:													
Average velocity, miles per hour.	7.8	8.3	8.7	9.2	7.8	6.7	6.5	6.3	6.5	7.8	8.7	8.3	7.8
Prevailing direction .....	e.	e.	e.	e.	e.	e.	e.	e.	e.	n., e.	e.	e.	e.

## MINES OF SAN FERNANDO, CUBA (1 year).

Temperature:													
Mean .....	69.9	71.4	73.2	74.6	77.9	78.9	80.5	79.6	78.6	75.9	72.7	67.9	75.0
Highest .....	79	78	82	83	85	85	86	87	86	81	80	77	87
Lowest .....	57	57	62	64	71	72	71	71	68	70	65	51	51
Rainfall:													
Total .....	2.74	0.59	2.49	2.09	20.28	14.56	...	...	...	...	...	...	...
Maximum in any shower .....	1.20	0.20	1.13	1.35	7.30	2.50	...	...	...	...	...	...	...
No. days on which rain fell ..	4	2	7	7	21	17	22	20	16	22	2	6	.....

## KINGSTON, JAMAICA (10 years).

Temperature:													
Mean .....	74.6	74.7	75.8	77.9	79.4	80.8	81.1	80.4	80.1	78.9	77.8	75.7	78.1
Highest * .....	86.4	85.8	85.7	86.5	87.2	88.5	89.7	89.4	89.7	88.9	88.9	87.0	89.7
Lowest * .....	66.8	66.8	67.8	69.8	72.4	73.8	73.5	73.2	73.3	72.1	70.7	68.4	66.8
Humidity:													
Mean relative, per cent. ....	78	78	77	75	78	78	76	79	80	81	78	78	78
Mean absolute, grs. per cu. ft.	7.2	7.2	7.4	7.7	8.4	8.7	8.6	8.8	8.8	8.6	8.0	7.5	8.0
Rainfall:													
Mean .....	0.96	0.32	1.59	1.02	6.00	5.51	2.15	4.09	3.59	4.69	1.22	1.50	32.64

## SAN JUAN, PUERTO RICO (12 years).

Temperature:													
Mean .....	76.6	75.7	76.6	77.9	79.3	81.5	81.1	81.3	81.0	80.6	79.2	76.5	78.9
Highest .....	93.2	92.5	95.4	95.0	100.8	99.3	96.8	99.0	96.8	97.9	99.1	92.5	100.8
Lowest .....	57.2	58.3	60.1	60.8	62.6	64.8	64.0	64.0	64.9	61.2	59.4	56.1	56.1
Rainfall:													
Mean .....	2.28	1.80	2.67	5.35	6.38	5.96	5.82	6.21	5.83	5.63	7.62	3.88	59.45
Greatest .....	8.60	5.26	12.40	11.78	12.25	8.91	11.58	17.07	10.00	11.98	11.73	6.31	82.64
Least .....	1.07	0.35	0.29	1.61	1.90	2.34	2.48	3.04	2.91	1.97	3.40	1.90	45.79

\* Probably the averages of the extremes.

TABLE VII.—Average number of rainy days at several places in the United States.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Key West *.....	8.1	6.8	4.9	4.5	8.5	11.8	12.6	14.6	16.4	12.4	8.0	7.2	117.7
Jacksonville †....	9.5	9.1	8.2	6.7	9.8	13.5	15.0	15.0	14.1	9.0	8.0	7.2	124.9
New Orleans ‡....	11.2	9.4	9.8	7.9	9.9	13.6	15.8	14.4	10.8	7.4	9.4	11.9	131.7
Charleston *.....	10.6	10.1	10.0	7.7	9.1	10.9	12.1	13.3	10.6	7.4	7.7	8.9	118.5
Washington *....	12.1	10.9	12.2	11.2	12.2	10.5	11.1	11.3	8.6	8.8	10.1	10.4	129.2
New York ‡.....	11.9	10.9	11.8	11.1	10.4	10.4	11.2	9.8	9.3	9.6	10.2	11.0	127.8
Boston *.....	12.8	11.1	12.8	11.4	11.2	10.3	11.0	10.4	9.6	10.0	11.1	11.7	133.0
Chicago *.....	11.8	10.8	12.0	11.4	11.8	11.4	9.2	9.0	9.0	10.1	11.0	12.1	131.1
St. Louis *.....	9.1	9.5	10.8	10.3	11.8	11.4	9.6	7.6	7.0	7.3	9.1	9.9	113.3
San Francisco *..	11.4	10.6	10.3	7.4	4.2	2.0	0.6	0.3	1.6	3.8	6.4	11.2	69.4

\* Record for 25 years.

† Record for 24 years.

‡ Record for 18 years.

TABLE VIII.—Location of stations from which meteorological data are quoted.

Place.	Lat. N.	Long. W.	Height above sea.	Place.	Lat. N.	Long. W.	Height above sea.
	° ' "	° ' "	<i>Feet.</i>		° ' "	° ' "	<i>Feet.</i>
Key West, Fla.....	24 34	81 49	46	San Juan, Porto Rico ...	18 27	65 39	.....
Nassau, N. P. ....	25 5	77 21	80	St. Thomas .....	18 21	64 56	13
Habana, Cuba .....	23 9	82 23	63	Ft. de France, Martinique.	14 40	61 2	.....
Matanzas, Cuba....	23 2	81 40	50	St. Pierre, Martinique...	14 46	61 7	46
Mines of San Fernando...	22 22	80 9	554	Kingstown, St. Vincent...	13 13	61 13	.....
Santiago, Cuba .....	19 55	75 50	.....	Bayabou, St. Vincent...	13 12	61 11	.....
Ubajay, Cuba .....	*	*	242	Barbados .....	13 4	59 37	.....
Denbigh, Jamaica .....	.....	.....	.....	Royal Botanical Gardens,	.....	.....	.....
Kingston, Jamaica .....	17 58	76 48	50	Trinidad .....	10 40	61 26	.....
Ross View, Jamaica .....	18 3	76 44	951	Merida, Yucatan .....	20 58	89 3	27
Port au Prince, Haiti .....	18 32	72 21	171				

\* About 15 miles southwest of Habana.

## WEATHER OF MANILA.

Manila, the capital and chief port of the Philippine Islands, is situated in latitude  $14^{\circ} 35'$  north, and in longitude  $121^{\circ}$  east of Greenwich.

Meteorological observations have been made for many years at the Observatorio Meteorologico de Manila. Observations of rainfall for thirty-two consecutive years, and of the other meteorological elements for seventeen consecutive years have been published by the Observatory. The appended table, compiled by Prof. H. A. Hazen, of the Weather Bureau, gives in a concise form the more important meteorological elements of the climate.

*Temperature.*—The average temperature of the year is  $80^{\circ}$  F. The months of April, May, and June are the hottest part of the year. May, with an average temperature of  $84^{\circ}$  F., is the hottest of the three. December and January are the coolest months, each with an average temperature of  $77^{\circ}$  F. The highest thermometer reading recorded is  $100^{\circ}$  F; this was observed in May. The lowest reading recorded is  $74^{\circ}$ , and was observed in January.

*Humidity.*—The average relative humidity is 78 per cent. That of the most humid month, which is September, is 85 per cent, and that of the least humid month, which is April, is 70 per cent. The average absolute humidity is 8.75 grains in a cubic foot. It is greatest in August and least in February.

*Rainfall.*—The average annual rainfall is 75.43 inches, of which 43.69 inches, more than 57 per cent, fall during the months of July, August, and September, and 50.74 inches, more than 80 per cent, fall from June to October, inclusive. September has the largest average fall, 15.01 inches, and February the smallest average fall, 0.47 inches. The heaviest rainfall in any one month was 61.43 inches, in September, and sometimes no rain at all has fallen in February, March, April, and May.

Departures from the average rainfall are in some instances remarkable. For example, as much as 120.98 inches have fallen in one year, and as little as 35.65 inches in another. Still more remarkable was the fall of 61.43 inches in one September, and that of only 2.00 inches in another September.

TABLE IX.—*Temperature, rainfall, etc., at Manila.*

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Temperature (degrees F):													
Mean monthly.....	77	78	81	83	84	82	81	81	81	80	79	77	80
Warmest month.....	79	81	82	85	87	85	82	82	82	82	81	80	82
Coollest month.....	74	76	79	81	82	81	79	80	79	79	77	75	79
Highest.....	91	96	96	99	100	98	95	94	94	95	94	92	100
Lowest.....	60	61	65	66	71	70	70	69	71	69	63	60	60
Humidity:													
Relative, per cent.....	77	73	71	70	75	80	84	84	85	82	80	80	78
Absolute, grains per cu. ft.	7.75	7.60	7.90	8.42	9.27	9.39	9.33	9.53	9.33	9.24	8.59	8.06	8.75
Wind movement in miles:													
Daily mean.....	98	115	132	145	144	138	182	165	192	111	94	93	134
Greatest daily.....	152	187	220	229	236	361	267	264	282	196	164	153	204
Least daily.....	66	72	82	92	68	96	110	79	69	48	67	59	95
Prevailing wind direction....	ne.	e.	e.	se.	se.	se.	sw.	sw.	sw.	ne.	ne.	ne.	.....
Cloudiness, per cent.....	45	37	35	32	47	65	74	68	72	58	54	53	53
Days with rain.....	4.3	2.2	3.4	3.5	9.2	15.4	22.1	19.8	20.7	14.4	11.3	8.4	135
Rainfall in inches:													
Mean monthly.....	1.15	0.47	0.65	1.11	4.30	9.68	14.70	13.88	15.01	7.47	4.92	2.09	75.43
Greatest monthly.....	7.59	1.97	3.94	5.37	10.11	25.81	29.71	43.20	61.43	23.65	15.27	13.67	120.98
Least monthly.....	0.02	0.00	0.00	0.00	0.00	0.98	5.28	5.15	2.00	0.90	1.17	0.01	35.65

Rainfall record for 32 years, 1865-1896; remaining data for 17 years, 1880-1896.

